

POST HATCHING DEVELOPMENT OF MALE AND FEMALE*Latrodectus hasselti indicus* F. O. Pickard-Cambridge, 1902**Vipul Sharma**

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ABSTRACT

This article is not only about reporting the presence of *Latrodectus hasselti indicus* in Zeerabad (Dhar) Madhya Pradesh for the first time but the author is able to rear this spider in Laboratory. A characteristic hour glass shaped mark found on the mid ventral side of many red back female spider was not found in all studied females. The progeny had well developed cream colored hour glass mark at early stages of development which gradually disappear in adult male and remain in the form of only broken orange-red base lines in female. The male and female *Latrodectus* during development undergoes dramatic change in size and shape. Post hatching developmental studies of colour pattern in male and female *Latrodectus* of this kind has proved to be of fundamental importance in elucidation of complex taxonomic problems in a number of spider genera, including *Latrodectus*.

Key words:- *Latrodectus hasselti indicus*, Hour glass mark, Theridiidae.

INTRODUCTION

Theridiidae (comb-footed spiders) is the 5th most species-rich family of spiders, including 2450 species and 122 genera (World Spider Catalog, 2015). Among family Theridiidae, one nocturnal and web-building black widow spider (genus *Latrodectus*; Walckenaer, 1805) is widely known for its venomous bite, which is rarely lethal but painful. *Latrodectus* is cosmopolitan in distribution, occurs widely throughout the tropical and temperate regions of the world like Argentina, the Middle East, South Africa and North America being very rich in diversity. There are currently 31 valid species of *Latrodectus* found through out the world.

Latrodectus has been the subject of numerous clinical, behavioral, ecological (Hippargi *et al.*, 2012) and toxicological studies. The general and developmental biology of *Latrodectus* has been extensively worked upon American species *L. mactans* (Kaston, 1970). *Latrodectus hasselti thorelli* was common in Australia and New Zealand. *L. hasselti* is commonly called as redback spider because of the red stripe on the posterior dorsal side of the female (Figure 3) similar to *L. katipo*, a distinctive feature which is missing in *L. atritus* females (Forster and Kingsford, 1983).

In all the species of *Latrodectus* male is very small in size and altogether different in appearance as compared to female and may not have a redback. In India, *Latrodectus* is represented by only single species *L. hasselti* Thorell, 1870. The earliest report of *L. hasselti* from India was from Pune, Maharashtra (Pocock, 1900). In 1961, its occurrence was reported by Daniel and Soman from Thana, Mumbai. In 2001, *L. hasselti indicus* was reported from Baroda, Gujarat (Siliwal and Kumar, 2001) and from Coimbatore, Tamil Nadu in 2005. Indian research papers mainly deals with general information of the redback spider. Workers were neither able to rear *Latrodectus* in lab nor report them second time in the field.

This paper is not only about reporting the presence of *L. hasselti indicus* F. O. Pickard-Cambridge, 1902 in Madhya Pradesh for the first time as its presence in the nearby district was also reported. The author was able to rear the spider in a laboratory

very easily. This paper also explains the morphological changes that occur during formation of adult male and female from nascent hatchlings. Post hatching developmental studies of color pattern in male and female *Latrodectus* of this kind have proved to be of fundamental importance in elucidation of complex taxonomic problems in a number of spider genera, including *Latrodectus* (Seligy, 1970).

MATERIALS AND METHODS

One adult female *L. hasselti indicus* (Figure-1) was collected from Zeerabad (Latitude 22° 22' 30" : longitude 75 ° 7' 30") (Dhar) Madhya Pradesh, a famous cretaceous site for fossil studies. Specimen collected only out of curiosity was, later, found to be a fertile female *Latrodectus*. This *Latrodectus* was housed below a coralline limestone rock. The web was very small, constructed in the dark places near the ground and appeared to be like disorganized threads of silk. After taking photographs and handling it with bare hands spider is found to be a timid and non aggressive. There was no incidence of biting and immunological reactions by its silk while handling it during the period of study.

The female was reared in the laboratory, but temperature and day-night duration was not controlled. The female was collected in mid February 2010 when winter was receding. The spider was kept in a plastic, transparent bottle measuring 8×3 cm with perforated lid. Some times the perforation was very small, done with the help of common pins, to prevent red ant attack. The spider was kept in a laboratory with temperature was usually 2°C below the outside temperature. The maximum temperature of the lab was recorded at 44°C, in first week of May.

The female was given live food mainly house fly (*Musca domestica*), spiders of Salticidae family, Caterpillars, Dragonfly to adults and 3 *Drosophila melanogaster* to spiderlings. The food was provided every day at the evening only. 30 days old spiderlings were fed on house flies. No water was given to spiders. Within three months she delivered 9 egg sacs. Each egg sac was carefully separated from the web after two days of laying and kept in a separate labeled bottle. Even while separating from the egg sac, the spider remained docile. From each egg sac 5 spiderlings were selected and carefully observed and photographed till they attained maturity.

RESULTS AND DISCUSSION

If given a good space for construction of web in bottles they construct a cobweb with a retreat. The spider very frequently hangs upside down near the center of its web and waits there for insects to get stuck. Then, before the insect can extricate itself, the spider rushes over to cover the prey with silk using 4th pair of legs and immediately connects the the prey with the threads, bites it and swathes it in a silken shroud. If it is housed in closed container and gets big size prey like Lizard baby or fully grown Cockroach which destroy the whole web, the spider wait for the moment when the prey becomes weak and stick their legs in the web and hang. They have very poor eyesight and depend mostly on vibrations reaching them through their web. A mature female also recognizes the vibration of the male. When a sexually mature male was introduced suddenly to the close captive female, she did not attack the male and was very congenial with him.

The *Latrodectus* is known for its neurotoxic (McCrone and Levi, 1966) venom that produces a massive liberation of neurotransmitters which can cause severe

muscle spasms and cramping. Other symptoms include nausea and/ or vomiting, increased blood pressure, extreme diaphoresis, piloerection and in severe cases paralysis, seizures, and psychological changes and in rare cases death may occur (Nyffeler *et al.*, 1988). Among the proteins that cause the latrodectism one most important is α -latrotoxin (Maretic, 1983; Orí, and Ikeda, 1998; Grishin, 1998; Orlova *et al.*, 2000). This results in a dramatic release of acetylcholine at the neuromuscular junction, causing muscle contraction and perforation in the vertebrate cell membrane.

The female delivered 9 egg sacs after 30 days of feeding and after that, 14-17 days were required for hatching a egg sac. Before hatching the egg sac become dark because of pigment development in the first instar spiderlings. 65-238 spiderlings were observed from 9 different egg sacs. The newly hatched spiderlings were 2-2.5mm in size (from pedipalp to abdomen), whitish-creamish with 3-4 black dots on the dorsal side of abdomen anterior to posterior in two rows. Along with the dots fading irregular black lines were also seen on the dorsal side. Ventral sides of the spiderling in both the sexes were brownish, developing later into a black background. The anterior black dots were bigger and posterior dots smaller.

During development females usually mature in the sixth instar, males in the fourth instar stage. The first instar (egg to 1st molt) occurs in the egg sac; spiderlings emerge as 2nd instar individuals. After hatching the spiderling remained suspended quiescent in to proximity each other near the egg sac and do not show cannibalism or feeding usually for 36 hours.

When web was disturbed by a prey, spiderlings ran quickly towards the site of disturbance. After third moulting, spiderlings remain quiet even when disturbed for food. Club shaped pedipalps in males are very prominent even at early stages of development and can be easily identified with small magnification. The adult female *Latrodectus* is known to be identified by hour glass shaped mark on the mid ventral side of the abdomen between female genital opening, the epigynum and spinnerets, but in many species this mark is reduced to only two base lines of hour glass. The progeny of the adult female and the adults developed after back cross in the laboratory, had well developed cream colored hour glass mark at early stages of development which gradually disappear in adult male (Figure 6) and remain in the form of only broken orange-red base lines in female (Figure 1) This observation is different from the view of Siliwal and Kumar (2001) who clearly mentioned a shorter and broader hour glass structure in *Latrodectus hasseltii indicus*. This difference might be because of difference in species or strains.

Within a week after hatching many devoured other spiderlings which can be due to cannibalism. If all the spiderlings are kept as such in one bottle for 45 days ultimately only one male or female survives. Though, both the male and female hatchlings were alike, gradual differentiation during development gave them an altogether different hue.

On proper feeding, spiderlings moulted second time in 10 days. Though lower temperature delays the development, the laboratory temperature never went below 28°C even at night. In one experiment, upper limit of temperature tolerance for development to emergence was found to be around 30°C (Downes, 1987) but in this experiment laboratory temperature was found to be higher (38-44°C) whereas Zeerabad, the site from where the spider was collected usually shows a rise to 47-

48°C in summer. At this stage, especially in female spiderling (Figure 4) at anterior dorsal two black dots started fusing in the middle and hexagonal black boundary patches could be seen on dorsal side.

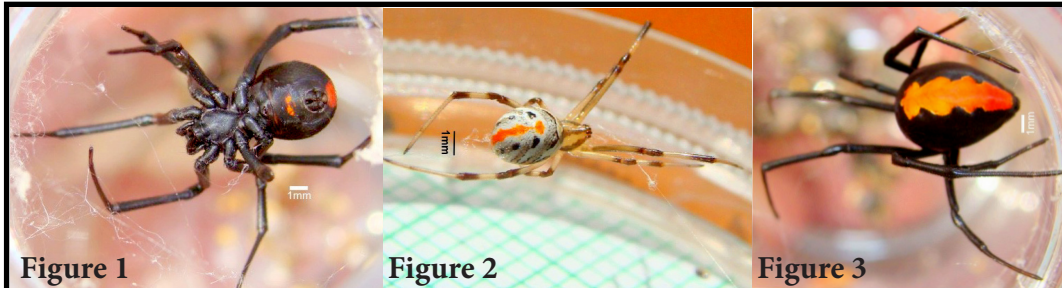


Figure 1

Figure 2

Figure 3

Figure 1: Ventral view of a female *Latrodectus hasselti indicus*.

Figure 2: Dorsal view of a 24-day post hatching female spiderling showing development of redback.

Figure 3: Adult female *Latrodectus hasselti indicus* showing dorsal side of abdomen.



Figure 4

Figure 5

Figure 6

Figure 4: 10 days post hatching female spiderling of *Latrodectus hasselti indicus*.

Figure 5: Adult male *Latrodectus hasselti indicus* showing white streak on posterior most dorsal side of abdomen.

Figure 6: Adult male *Latrodectus hasselti indicus* showing ventral side of abdomen.

After 16 days post hatching and 3rd moult during development a red-orange hazy streak appeared from posterior side adjacent to spinnerets and gradually thickened after 4th moult (24 days post hatching) and became bright orange (Figure 2) in next 6 days as development progressed. On the ventral side the hour glass base became light orange in colour. Contrary to females, male spiderlings in this genus never showed development of red back but the ventral hour glass in male showed light orange tint. 28 days after hatching color changed very fast in females. Orange-red back margined by white area became thick and four black dots fused forming a black lateral side above the arrow head of the red back a black belt appeared margined by white streak.

38 days post hatching 5th moult took place and all the white area adjacent to the black and orange-red belts reduced very sharply till this time developing female showed complete but light colored hour glass. 49 days after hatching the female became black without white margins and hourglass shape; only bases of the hourglass could be seen. At this stage female *Latrodectus* was a perfect copy of adult one. She did not show any interest in copulation but only fed on prey and moulted 7th time, 70 days after hatching. The shortest time between oviposition

and maturity for a female *L. hasselti* was 58 days. Males were always found to mature first as compared to female of the same hatchling (Seligy, 1970).

The hour glass or base lines of hourglass structure were not seen in adult *L. hasselti indicus* male. After hatching from egg case male spiderlings looked similar to that of female. During development into sexually mature male they underwent a lot of changes. Newly hatched male spiderlings had white abdomen with 4 pairs of black dots in two rows, brown head and cream colored legs and pedipalp. The joints in the legs were also brown in color. The ventral side on the brown abdomen had a cream color hour glass mark. Two more moults took place within 29 days after hatching and the globular abdomen started elongating and reducing in size. From the lateral view one can observe a depression on the mid dorsal side of the abdomen. Two wavy and thunder bolt like white belt could be seen on both lateral sides of the depression. The pedipalp, head and ventral side of abdomen became dark brown having pale yellow-orange color hour glass mark. On the dorsal side of four pair black dots become larger and fused, surrounded laterally by white belt like design not complete on the posterior most part. Covering one fourth part on mid dorso-posterior part of the abdomen was seen a small white belt surrounded by posterior extremities of fused black dots. 4th moulting took place 45 days post hatching made ventral abdomen black with faded margin of the hour glass base. Mid abdomen developed a clear depression on dorsal side which also had a broken lateral white belt. Mid postero-dorsal side contains a small white streak, which appeared like a key or Guitar shaped (Figure 5) in healthy males. Five to six was the maximum number of moults underwent by *L. hasselti* male in one study (Forster and Kingsford, 1983; Cariaso, 1967). Over all the males were almost 6 to 8 times smaller than a gravid female and had comparatively larger legs than their body size. Males constructed a poor quality of small web. While the females always found to be interested in food capturing, males found to be austere. Adult males were very rarely seen devouring food.

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